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Claims

1. A membrane electrode assembly comprising two electrochemically active electrodes separated by a polymer electrolyte membrane, characterized in that there is a polyimide layer on each of the two surfaces of the polymer electrolyte membrane that are in contact with the electrodes.
2. The membrane electrode assembly of claim 1, characterized in that the thickness of the polyimide layer is in the range from 5 μm to 1000 μm .
3. The membrane electrode assembly of claim 1 or 2, characterized in that the polyimide layers on the polymer electrolyte membrane each form a frame.
4. The membrane electrode assembly of one or more of the preceding claims, characterized in that the two electrodes have an electrochemically active area whose size is at least 2 cm^2 .
5. The membrane electrode assembly of one or more of the preceding claims, characterized in that at least one of the polyimide layers is coated with fluoropolymers.
6. The membrane electrode assembly of claim 5, characterized in that the layer of fluoropolymer has a thickness of at least 0.5 μm .
7. The membrane electrode assembly of claim 5 or 6, characterized in that the fluoropolymer is FEP.
8. The membrane electrode assembly of one or more of the preceding claims, characterized in that the polymer electrolyte membrane comprises polyazoles.
9. The membrane electrode assembly of one or more of the preceding claims, characterized in that the polymer electrolyte membrane is doped with an acid.
10. The membrane electrode assembly of claim 9, characterized in that the polymer electrolyte membrane is doped with phosphoric acid.
11. The membrane electrode assembly of claim 10, characterized in that the concentration of the phosphoric acid is at least 50 by weight %.

12. The membrane electrode assembly of one or more of the preceding claims, characterized in that the membrane is obtainable by a method comprising the steps of
 - A) mixing one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids and/or esters thereof containing at least two acid groups per carboxylic acid monomer, or mixing one or more aromatic and/or heteroaromatic diaminocarboxylic acids in polyphosphoric acid to form a solution and/or dispersion,
 - B) applying a layer using the mixture according to step A) to a support or to an electrode,
 - C) heating the sheetlike structure/layer obtainable according to step B) under inert gas to temperatures of up to 350°C, preferably up to 280°C, to form the polyazole polymer,
 - D) treating the membrane formed in step C) in the presence of sufficient moisture until it is self-supporting.
13. The membrane electrode assembly of claim 10, 11 or 12, characterized in that the degree of doping is between 3 and 50.
14. The membrane electrode assembly of one or more of the preceding claims, characterized in that at least one of the electrodes is made of a compressible material.
15. The membrane electrode assembly of one or more of the preceding claims, characterized in that at least one of the polyimide layers is in contact with at least one of the electrodes.
16. The membrane electrode assembly of claim 15, characterized in that the surfaces of the polymer electrolyte membrane are completely covered by the two electrodes and the polyimide layers.
17. The membrane electrode assembly of claim 15 or 16, characterized in that the contact area between polyimide layer and electrode is at least 5 mm².
18. The membrane electrode assembly of claim 17, characterized in that the contact area is less than or equal to 100%, based on the electrochemically active area.

19. The membrane electrode assembly of one or more of claims 15 to 18, characterized in that the contact area of the electrode is provided with fluoropolymer.
20. The membrane electrode assembly of one or more of the preceding claims, characterized in that the two polyimide layers extend beyond the membrane and are in flat contact with one another.
21. The membrane electrode assembly of claim 19, that the two polyimide layers are welded to one another.
22. The membrane electrode assembly of one or more of the preceding claims, characterized in that the two polyimide layers are in contact with electrically conducting separator plates.
23. The membrane electrode assembly of one or more of the preceding claims, characterized in that the surfaces of the polymer electrolyte membrane are covered completely by the two electrodes and the polyimide layers.
24. A fuel cell comprising at least one membrane electrode assembly according to one or more of claims 1 to 23.